Original Article

Reasons for Failure of Primary Endodontic Treatment

Endodontic Treatment

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ABSTRACT

Objective: The aim of this study was to evaluate the causes of primary endodontic treatment failure.
Study Design: Observational study.
Place and Duration of Study: This study was conducted at the Operative Dentistry Department of Rehmat Memorial Dental Teaching Hospital, Abbottabad (Women Medical College and Dental College) from February 2018 to July 2018.
Materials and Methods: A total of 82 patients of both genders (male and female), referred for endodontic retreatment were included in the study. The study was approved by the institutional ethical committee.
Results: Results indicated pain as the primary presenting complaint of root canal treated teeth (81%). The maximum number of failed treatments were reported in the mandibular molars(58%). Radiographic evaluation indicated underobturation (47%), missed canals (22%) and poor obturation (15%) as being the major causes of failed endodontic treatment.
Conclusion: The major factors responsible for endodontic treatment failure in this study were the defects in obturation with underobturation, poor obturation and missed canals making the highest contribution to failures.
Key Words: Endodontic Failures, Missed Canals, Poor Obturation

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INTRODUCTION

The goal of endodontic treatment is to reduce or eliminate microorganisms from the root canal space, prevent reinfection and promote healing of the periapical tissue by sealing the root canal system.[1,2]
Generally success of RCT is considered only when there is no further need of any intervention. But it can be analyzed with reference to dentist and patient perception. For the dentist it involves absence of pain, no periapical lesion, a completely filled root canal system on a radiograph, and a well restored and functional tooth. From the patients point of view, only the absence of pain is essential for successful RCT.[3] The success rate of RCT is estimated to be 90-95%.[4] Despite this high success rate failures still occur due to lack of knowledge and non-implementation of the basic principles of endodontics.[1] Most important reason for primary endodontic failure is either the persistence of bacteria and necrotic tissue in the root canal system or recontamination because of poor seal.[4,5] The factors which lead to bacterial persistence are improper asepsis, inadequate preparation and obturation of canals, defective coronal restorations and a number of procedural errors including perforations, missed canals, ledges separated instruments, transportations.[1,4,6-10]
A number of studies have been conducted to evaluate the causes of primary endodontic failures. According to a study undertaken in Srinagar 90.9% of patients presenting with primary endodontic failure had substandard obturation and 60.6% patients had defective coronal restoration.[1] Another study undertaken by Iqbal A, et al proposed underfilled canals (33.3%) and unobturated or missed canals (17.7%) to be the major causes of primary endodontic treatment failures.[11] The aim of this study is to evaluate primary endodontic failure of teeth based on clinical and radiographic findings in patients reporting to Operative Dentistry department, RMDTH, Abbottabad (Women Medical College and Dental College). This would be the first step in providing better endodontic treatment that is to identify the cause of failure and to help avoid such deficiencies in future. A few patients were excluded because of lack of conformity between the two dentists.

MATERIALS AND METHODS

This study was conducted at Rehmat Memorial Dental Teaching Hospital, Abbottabad (Women Medical College and Dental College). A total of 82 patients of both genders (male and female), referred for endodontic retreatment from the time period February 2018 to July 2018 were included in the study. The study was approved by the institutional ethical committee.

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The inclusion criteria were patients who had undergone root canal treatment and presented with complaint in the tooth and also endodontically treated asymptomatic teeth not considered suitable for prosthetic rehabilitation. The exclusion criteria included teeth that had undergone retreatment before.

Informed consent was taken from the patients. History was taken and clinical examination performed. Demographic details, the affected tooth number, and presenting complaint like pain, swelling, food impaction, fractured restoration and pus drainage were documented. Other parameters noted include time since the completion of the last treatment and the number of visits. All patients were examined by two dentists individually and the study included only those patients about whom findings of both the consultants were in conformity with each other.

Clinical examination comprised of visual inspection, response to percussion, status of the coronal restoration and the presence of crown or fixed partial denture. Radiographic evaluation included the presence or absence of radiolucent lesion, the quality of obturation, missed canals, presence of separated instrument or an indication of perforation. The quality of obturation was categorized as under obturation that is obturation or root canal filling more than 2mm short of apex. Obturation that extended pass the apex was considered over obturated and root canal filling that was not compact or had voids was considered poorly obturated.

The data obtained was entered into Microsoft Excel 2007 for analysis.

RESULTS

The total patients included in the study were 82 including 46 females (56%) and 36 males (44%) as shown in (figure 1). Maximum number of patients belonged to the age group 40-49 years. Out of the teeth taken for retreatment there were 32(39%) maxillary teeth and 50(61%) mandibular teeth. Maximum number of teeth i.e. 48 teeth (58%) were mandibular molars. Second to these are the maxillary molars (12 teeth, 15%) and premolars (12 teeth, 15 %) having an equal involvement (Table 1).

According to the chief complaint, 66 patients (81%) presented with the complaint of pain. There were 8 patients (10%) who were asymptomatic and referred for retreatment for the purpose of prosthetic rehabilitation. The number of patients who presented with the complaint of defective restoration or food impaction was 6(7%). And only 2 patients (2%) presented with swelling as shown in Table 2. All cases reported were treated in multiple visits for root canal treatment. Results indicate that the maximum no of patients presented within 1 year of the previous endodontic treatment that is 40 patients (49%).

Clinical examination showed the presence of crown or fixed partial denture on only 12 cases (15%), and 70 cases (85%) showed no fixed prosthesis (table 3). Coronal restoration was found to be intact in 60 teeth (73%) and was fractured or missing in 22 teeth (27%) (Table 4). Radiographic evaluation indicated underobturation in 38 cases(47%), missed canals in 18 cases((22%), poor obturation in 12 cases(15%), overobturation in 6 cases(7%), separated instrument in 4 cases(5%) and evident perforation in 2 cases (2%) (Table 5). According to our results 60 teeth(73%) presenting with primary endodontic failure showed signs of periapical pathology on radiograph.

Table No.1: Distribution of teeth in failed root canal treatment.

	Maxillary (32)				Mandibular (50)			
	Incisor	Canine	Premolar	Molars	Incisor	Canine	Premolar	Molar
Number	4	4	12	12	0	0	2	48
Percent	5%	5%	15%	15%	0	0	2%	58%

Table No.2: Chief complaint of patients presenting with endodontic treatment failure.

Chief complaint	No. of patients	Percentage
Pain	66	81%
Swelling	2	2%
Defective restoration/ food impaction	6	7%
Prosthetic need	8	10%

Table No.3: Presence of fixed prosthesis on root treated tooth

Presence of crown	No. of patients	Percentage
Present	12	15%
Absent	70	85%

Table No.4: Status of the coronal restoration

Coronal restoration	No. of patients	Percentage
Intact	60	73%
Not intact	22	27%

Table No.5: Radiographic findings of the tooth with failed root canal treatment.

Radiographic Findings	No. of patients	Percentage
Underobturation	38	47%
Overobturation	6	7%
Missed canals	18	22%
Perforation	2	2%
Separated instrument	4	5%
Poor obturation	12	15%
Normal	2	2%

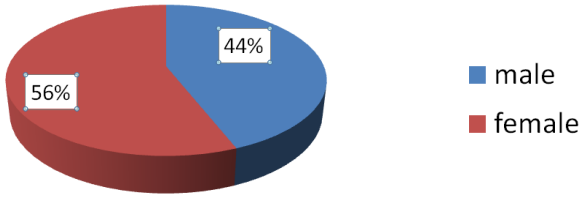

Figure No.1: Failed RCT cases

DISCUSSION

The root canals harbor bacteria and tissue debris that act as a source of infection and inflammation to the apical periodontium after irreversible pulpitis. The aim of endodontic treatment is to render the root canals bacteria and debris free by adequate cleaning and shaping of the root canals and to obliterate the canals by a dense three dimensional root canal filling.[2]

The results of this study indicated that the frequency of root canal failure in female patients is 56% and in males is 44%. Similar results were shown in a study by Misgar OM, et al having 43.3% males and 56.7% females presenting with primary endodontic failure.[1] This may be attributed to the fact that there are more female patients undergoing root canal treatment than male patients.[12]

The maximum number of patients (49%) reporting with primary root canal failure belonged to the age group between 40-49 years. Another study by Iqbal A, et al reported 41.11% failures in the age group between 41-50 years and explained this as being due to presence of calcified canals, uncooperative behavior, poor oral hygiene maintenance and low literacy rate.[11]

According to the results, the maximum number of teeth presenting with root canal failure were the mandibular molars (58%), being due to the fact that mandibular first molars are the first teeth to erupt and are hence more prone to dental decay.[13] Study by Misgar et al showed contrasting results with maxillary incisors reporting with maximum number of primary root canal failures(27%).[1]

The study showed that the coronal restoration was intact in 73% of cases presenting with primary endodontic failure, indicating that defective coronal restoration may have contributed to 27% of the failure cases. Misgar OM et al reported in his study 66.6% cases with defective or missing restorations.[1] Several authors have reported that even when root fillings are satisfactory leakage of bacteria and their products along the length of the root canal is impossible to prevent.[14,15] Hence studies have shown that sealing the coronal aspect of the tooth is of equal importance as the apical seal of the tooth for the healing of periapical tissue after root canal treatment.[16]

The factors considered for evaluation of the quality of root canal obturation on a radiograph are length, taper, density and homogeneity.[17,18] The quality of obturation reflects the cleaning and shaping of the root canals.[19] In the present study the quality of obturation was found to have a significant contribution to the failure of endodontic treatment with 47% (38 cases) showing under-obturation, 7% (6 cases) showing over-obturation, 15%(12 cases) showing poor obturation and 22% (18 cases) indicated missed canals. According to a study by Hoen 65% of the teeth with failed root canal treatment exhibited poor quality obturation whereas 42% teeth had some canals which were left untreated.[20] The reason for flaws in obturation contributing to treatment failure is that with poor obturation of canals the apical seal is not established and contributes to failure due to microbiological persistence.[21]

Another factor in the radiographic analysis was the presence of separated instruments in 5% cases. Iqbal A et al reported similar results in his study with the presence of a separated instrument in 6.6% cases.[11] The influence that a separated instrument has on the prognosis of the endodontic treatment is determined by the poor filling quality due to separation and the stage of disinfection at the time of instrument separation. Causes for instrument fracture include improper use, limitations in physical properties and manufacturing faults with the most common cause being improper use in the form of overuse of instruments.[22]

The limitation of this study is that in some cases multiple radiographic findings were present that may have contributed to the failed treatment. The finding that was most probable was taken into consideration. No pre-operative radiograph could be retrieved from any of the participating patients so comparison of the size of the periapicallesion could not be made. Hence all periapical lesions associated with significant abnormality of root canal filling were taken as a positive finding.

CONCLUSION

This study concludes that endodontic treatment failure is caused by multiple factors. The major factors responsible for endodontic treatment failure in this study were the defects in obturation with underobturation, poor obturation and missed canals making the highest contribution to failures. Further studies in this regard will be helpful in determining the causes and thus preventing the failure of endodontic treatment.

Author's Contribution:

Concept & Design of Study:	Khadija Jahanzeb
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Data Analysis:	Fasial Pasha
Revisiting Critically:	Khadija Jahanzeb, Syed Imran Shah
Final Approval of version:	Khadija Jahanzeb

Conflict of Interest: The study has no conflict of interest to declare by any author.

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